

WHAT IS CLAIMED IS:

1. A method for organizing regions identified in image data, comprising one or more of:
 - forming one or more color clusters, each color cluster including regions of the image data having a color difference that is less than a color threshold; and
 - grouping two or more regions included in a color cluster into one of one or more spatial clusters if closest boundaries of the two or more regions are within a distance threshold.
2. The method of claim 1, further comprising:
 - averaging colors of regions of a spatial cluster to generate an average color;
 - assigning the average color as a color of the spatial cluster; and
 - setting a size of the spatial cluster to a total number of pixels contained in the spatial cluster.
3. The method of claim 2, further comprising:
 - sorting the spatial clusters according to their sizes.
4. The method of claim 2, further comprising:
 - assigning each spatial cluster to a binary output plane.
5. The method of claim 4, further comprising:
 - creating a background plane which contains one or more regions of the image data that are not included in any color cluster.
6. A method for organizing regions identified in image data, comprising:
 - dividing an image area of the image data into a plurality of tiles;
 - assigning one or more regions of the image data to a tile based on a location of a bounding box of each of the regions, and one or more of:
 - forming one or more color clusters by including, in each color cluster, regions of the tile that have colors that differ by less than a color threshold;
 - and
 - grouping two or more regions included in a first color cluster into a spatial cluster, if closest boundaries of the two or more regions are within a distance threshold.
7. The method of claim 6, further comprising:

creating a new color cluster for a first region within the tile if the first region is not included in any other color cluster.

8. The method of claim 7, further comprising:

creating a new spatial cluster within a second color cluster if a closest boundary of a second region of the second color cluster not included in an existing spatial cluster is greater than a distance threshold away from a boundary of any other region of the existing spatial cluster within the second color cluster.

9. The method of claim 8, further comprising:

a) combining 2x2 blocks of tiles into new tiles;

b) one or more of:

combining color clusters within a new tile if colors of regions of the color clusters within the new tile are less than the color threshold apart; and

combining spatial clusters within the new tile if boundaries of regions of the spatial clusters within the new tile are less than the distance threshold apart;

d) rename the new tiles as tiles; and

repeat a) - c) until a single tile includes all the regions of the image data.

10. The method of claim 9, further comprising:

averaging colors of regions of a color cluster or a spatial cluster to generate an average color;

assigning the average color as the color of the corresponding color or spatial cluster; and

setting a size of the color or spatial cluster to a total number of pixels contained in the spatial cluster.

11. The method of claim 10, further comprising:

selecting a spatial cluster;

identifying regions of the selected spatial cluster which are completely contained within other regions; and

eliminating the identified regions from the selected spatial cluster before generating the average color.

12. The method of claim 11, wherein identifying regions comprises:

determining if a first region completely surrounds a second region on all sides; and

determining for each pixel along a midline of a bounding box of the second region, at least one pixel belonging to the first region, and at least one subsequent adjacent pixel belonging to the second region.

13. An apparatus for processing regions of image data, comprising:

a color cluster processor that forms one or more color clusters by grouping regions of the image data which are within a color threshold of each other, and/or a spatial cluster processor that forms one or more spatial clusters for each of the color clusters, regions of the color cluster being included in the spatial cluster when their respective bounding boxes are within a distance threshold of each other; and

a planes generator which creates binary output planes based on the color or spatial clusters.

14. The apparatus of claim 13, wherein the color cluster processor also divides an image area of image data into a set of tiles, and assigns the regions of the image data to the tiles based on a location of a bounding box of each of the regions, and groups the regions into clusters depending on color and/or spatial characteristics of the regions.

15. The apparatus of claim 14, comprising a tile processor that:

a) combines 2x2 blocks of tiles into a new tile;

b) one or more of:

1) combines the color clusters from the 2x2 blocks of tiles to form a new color cluster in the new tile if colors of regions of the color clusters in the tiles are within a color threshold of each other, and

2) combines regions of each new color cluster having bounding boxes which are less than a distance threshold apart;

c) renames the new tiles as old tiles;

and repeats a)-c) until a single tile includes all regions in the image data.

16. The apparatus of claim 13, further comprising:

a color averager that calculates an average color value of either a color cluster based on colors of regions included in the color cluster, or a spatial

cluster based on colors of regions included in the spatial cluster, and calculates a size of the color or spatial cluster based on a total number of pixels of the regions included in the color or spatial cluster.

17. The apparatus of claim 13, further comprising:
an inner blob module which eliminates color and/or spatial clusters which are not larger than a predefined threshold size.
18. The apparatus of claim 13, further comprising:
an inner blob module which eliminates regions from color and/or spatial clusters which are determined to be completely contained within other regions.
19. The apparatus of claim 13, further comprising:
a marking module which marks regions which do not conform to a set of predefined criteria.
20. The apparatus of claim 13, further comprising:
a module which sorts the color and/or spatial clusters according to size.
21. A computer-readable medium having computer-readable program code embodied therein, the computer-readable program code performing the method of claim 1.
22. A xerographic marking device using the method of claim 1.
23. A digital photocopier using the method of claim 1.